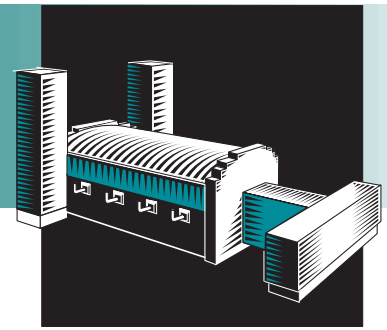


# GLASS

## Project Fact Sheet



## MOLYBDENUM DISILICIDE COMPOSITES FOR GLASS PROCESSING SENSORS

### BENEFITS

- Increased production efficiency—availability of robust, affordable material will facilitate the widespread use of advanced sensors and controls designed to improve the manufacturing process
- Reduced manufacturing costs, since the composites are less expensive than noble metals
- No adverse environmental implications, as the composites are chromium-free

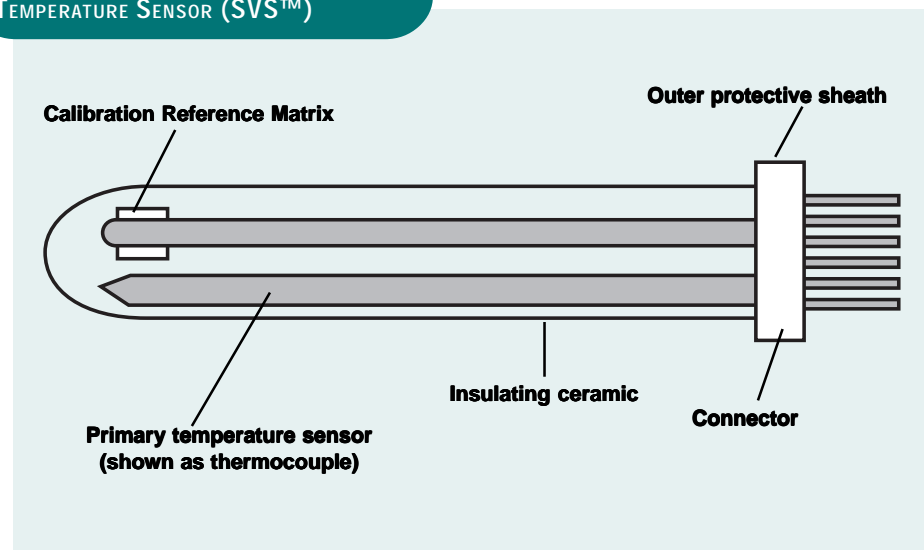
### APPLICATIONS

Since these new, affordable materials can withstand the severe mechanical and thermal stress of glass furnaces, they can be used throughout the glass industry for a variety of sensors and controls to improve the manufacturing process both cost-effectively and without any adverse environmental effects.

## ROBUST COMPOSITE TUBES WILL DRAMATICALLY IMPROVE GLASS SENSOR PERFORMANCE

A variety of advanced sensors used to increase the efficiency of glass manufacturing must be immersed in or placed in close proximity to molten glass. In order to optimize use of these sensors, the industry needs inexpensive, corrosion- and thermal shock-resistant materials to protect them. Los Alamos National Laboratory is working with Corning, Accutru International Corporation, Combustion Tec, Exotherm, and the Institute of Gas Technology to develop molybdenum disilicide hybrid composite tubes and coatings for thermocouple sheath applications. The molybdenum disilicide tubes offer numerous advantages. They are electronically conductive, stronger than ceramic refractory materials, free of environmentally detrimental chromium, and corrosion-resistant to molten glass environments. In addition, the new material is less expensive than noble metals as well as oxidation-resistant, allowing immersion without water cooling.

### CROSS SECTION OF A SELF-VERIFYING TEMPERATURE SENSOR (SVS™)



**The proposed molybdenum disilicide tube will provide robust protection to dramatically improve glass sensor performance.**



## Project Description

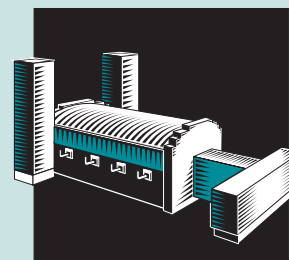
**Goal:** Develop robust, thermal shock-resistant molybdenum disilicide composite tubes and coatings for thermocouple sheath applications using unique plasma spray-forming techniques.

The research partnership will establish and optimize plasma spray-forming techniques for creating the composite tubes, which can be used as sheaths for sensors or as periscopic sight tubes for closed-circuit video sensors in glass furnaces.

## Progress and Milestones

This three-year project will include the following activities:

- Developing unique plasma spray-forming techniques
- Evaluating the composites' mechanical properties and corrosion resistance in molten glass
- Fabricating prototype sheaths and tubes and performing preliminary testing
- Demonstrating the technology in a glass furnace temperature measurement sensor system at Accutru and a closed-circuit glass furnace video monitoring system at Combustion Tec.



### PROJECT PARTNERS

Accutru International Corporation  
Kingwood, TX

Combustion Tec Inc.  
Apopka, FL

Corning, Incorporated  
Corning, NY

Exotherm Corporation  
Houston, TX

Institute of Gas Technology  
Des Plaines, IL

Los Alamos National Laboratory  
Los Alamos, NM

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